

#661

DYNAMICS EXPLORER 2
IDM/RPA DATA ON OPTICAL DISK
81-070B-06A
81-070B-07A

Dynamics Explorer 2

Ion Drift Meter (IDM)
81-070B-06A

Retarding Potential Analyzer Files (RPA)
81-070B-07A

This catalog contains two data sets. The IDM/RPA data sets consist of 5 tapes. The D tapes are 8 millimeter, low density, and the C tapes are 4 millimeter. The tapes were created using the Backup utility on a VAX computer. The data are written in binary and the documentation files are ASCII when restored to VMS Files-11 format. Backup listings have been included for reference. The tape numbers, and backup save_set names, along with the time spans follow:

D#	C#	Files	Save_Set Name	Time Span
D107809	C-031616	3	DEB6_0001A.BCK	08/15/81 - 02/16/83
D107810	C-031617	3	DEB7_0001A.BCK	08/06/81 - 02/21/82
D107811	C-031618	3	DEB7_0002A.BCK	02/21/82 - 09/06/82
D107812	C-031619	3	DEB7_0003A.BCK	09/06/82 - 02/17/83
D108237	C-032332	3	DE2RPA.BCK	08/06/81 - 02/16/83**

** This is the revised RPA data submitted in June '95. Both D and C tapes are high density, (8500 mode), 8 millimeter.

CCSDXZLM0001SMARK001CCSDXVNM0002SMARK002

LOG_VOL_IDENT: USANASANSSD0001
LOG_VOL_INITIATION_DATE: 1992-09-15
LOG_VOL_CLOSING_DATE: 1992-09-15
LOG_VOL_CAPACITY: 2.2GB
LOG_VOL_FILE_STRUCTURE: VAX FILES-11 STRUCTURE LEVEL 2
Written with backup utility as a save set with
name: 0001.BCK

TAPE_LENGTH: 106 METERS
VOLUME_DRIVE_MFGR_AND_MODEL: AVIV, model ACT850
COMPUTER_MFGR: DIGITAL EQUIPMENT CORPORATION
OPERATING_SYSTEM: VMS, VERSION 5.5
COMPUTER_SYSTEM: VAX 4000/500
TECHNICAL_CONTACT: Robert A. Power and/or Dr. William R. Coley
Center for Space Sciences
University of Texas at Dallas, M.S. Fo2.2
P. O. Box 830688
Richardson, Texas 75083-0688
214-690-2851
SPAN Address - UTSPAN::UTADNX::UTDSSA::POWER

PREV_LOG_VOLS: NONE

CCSDXVNM0002EMARK002CCSDXKNM0002SMARK003

DATA_SET_NAME: ION DRIFT METER FILES (IDM)
DATA_SOURCES: DYNAMICS EXPLORER 2, ION DRIFT METER (IDM)
SCIENTIFIC_CONTACTS: Dr. William B. Hanson and/or Dr. R. A. Heelis
Center for Space Sciences
University of Texas at Dallas, M.S. Fo2.2
P. O. Box 830688
Richardson, Texas 75083-0688
214-690-2851
SPAN Address - UTSPAN::UTADNX::UTDSSA::HEELIS

SOURCE_CHARACTERISTICS:

A. DESCRIPTION_OF_SPACECRAFT:

The Dynamics Explorer 2 spacecraft was one of two satellites launched for the Dynamics Explorer program. The two spacecraft were launched together into coplanar polar orbits for the purpose of studying coupling between the magnetosphere, ionosphere, and the atmosphere. The DE-2 spacecraft was placed in a low elliptical orbit whereas the DE-1 orbit was highly elliptical. Instruments aboard the DE-2 spacecraft were: magnetometer, vector electric field instrument, neutral atmosphere composition spectrometer, wind and temperature spectrometer, Fabry-Perot interferometer, ion drift meter, retarding potential analyzer, low altitude plasma instrument, and Langmuir probe.

B. ORBIT_INFORMATION:

Because the Delta launch vehicle did not complete a full burn the DE-2 satellite was placed in a lower than anticipated polar orbit, initially 1012 by 309 km. The orbital period was 98 min. The DE-1 and DE-2 satellites were launched by the same vehicle so that their orbits would be coplanar, allowing occasional two-point measurements along magnetic field lines. The DE-2 spacecraft spun once per orbit and the spin axis was perpendicular to the orbital plane so that one axis of the satellite always was aligned with the center of the earth.

C. PERFORMANCE:

The DE-2 spacecraft performed well through its lifetime. Power limitations forced the duty cycle to be limited to an average which was originally targeted at 30%. The lifetime of the spacecraft was shorter than anticipated because of the less than nominal performance of the launch vehicle. The launch was on August 3, 1981 and the DE-2 satellite reentered the atmosphere on February 19, 1983, with the last contact the day before.

INVESTIGATION OBJECTIVES:

Among the science objectives for the DE program was the study of the electrodynamics of the ionosphere and its application to ionosphere-magnetosphere interactions. The IDM objective was to provide a measure of the cross-drift ion velocity in the ionosphere. This data is used in studies of the ionospheric electric field and ionosphere-thermosphere interactions.

INSTRUMENT ATTRIBUTES:

A. DESCRIPTION OF INSTRUMENT

The Ion Drift Meter (IDM) consists of two sensors that view approximately along the spacecraft velocity vector. Each sensor has a square entrance aperture to a gridded region in front of a collector with four quadrant sectors. By comparison of the ion currents to each sector it is possible to measure the angle of arrival of the ions in two mutually perpendicular directions perpendicular to the look direction of the sensor. From this angular information, knowledge of the ion velocity along the sensor look direction from the RPA and knowledge of the spacecraft attitude, it is possible to derive the ambient ion drift along the two mutually perpendicular directions. (See Heelis et al., Space Sci. Instrum., 5, 511, 1981)

B. OPERATIONAL MODES:

The IDM provides absolute measures of the ion arrival angle 4 times per second and measurements of the angle relative to an absolute value, established every 8 seconds, at the rate of 32 samples per second.

C. MEASURED PARAMETERS:

Using the velocity of the spacecraft relative to the ambient plasma, it is possible to use the angular information provided by the IDM to compute the ion velocity along the mutually perpendicular directions (nominally horizontal, perpendicular to the spacecraft's orbital plane, and vertical).

D. PERFORMANCE OF THE INSTRUMENT:

The IDM provided data on the ion arrival angle for the entire duration of the DE-2 lifetime. Interpretation of this data in terms of ion drifts requires the assumption of zero ram drift during the period of failure (81317 06:26:40 UT to 82057 13:16:00 UT) of the Retarding Potential Analyzer (RPA). This is usually not a serious limitation (see DATA_SET_QUALITY).

E. RESOLUTION:

IDM geophysical data files provide absolute measurements of the cross track ion drift velocity 4 times per second

PARAMETERS:

IDM data files contain geophysical data in 8 second blocks corresponding to the standard segment of data on the DE spacecraft. Each 8 second block of IDM data containing 32 pairs of mutually perpendicular ion drift velocities in spacecraft coordinates, is accompanied by some orbit position information.

DATA SET QUALITY:

IDM data is of high quality since only absolute ion drift velocities have been retained in the data files. This higher resolution data has not been corrected for the presence of ion drifts along the sensor look direction. If such a drift V_x exists then the value in the file should be corrected by the factor $(V_s + V_x)/V_s$, where V_s is the spacecraft velocity along the sensor look direction. This correction factor can be as high as 20%. Values of V_x are available from the Retarding Potential Analyzer (RPA) files.

DATA PROCESSING OVERVIEW:

A. DATA PROCESSING CYCLE:

Raw telemetry segments were reduced to IDM mission analysis files (MAF's) utilizing production processing on the project computer. The cpu commitment to IDM analysis could not be retained during the periods when the TM was initially available. Thus a situation in which TM file promotion was required for IDM analysis evolved. This quickly resulted in a backlog of unprocessed TM which still exists. Though data files for most data segments exists some files do

not exist at all and others require complete reprocessing due to inadequate least-squares analysis.

B. HISTORY

All data was originally reduced on project computers at GSFC. More recently an attempt to transfer telemetry files to local computers at the investigators site has been undertaken. Some data files originate from reduction of telemetry on local computers. This data is usually of higher quality and higher temporal resolution owing to the resources that can be applied to it. It is not identified in any way as originating from this source.

DATA USAGE:

Usage of the geophysical data is not formally restricted. Users are urged to be cautious in interpretation of structure and discontinuities in the IDM data. In many cases such structure is real, but it may also be caused by instrumental noise or telemetry problems. Use of the data quality flags is encouraged to ensure that the data is used correctly.

DATA ORGANIZATION:

Geophysical data files exist for each DE2 telemetry segment. These data files may be identified by orbit number or by approximate UT start time.

CCSDXKNM0002EMARK003CCSDXKNM0002SMARK005

LOG_VOL_TIME_COVERAGE: 1981-08-15 TO 1983-02-16

TYPE_OF_FILE_TIME_COVERAGE:

IDM 1981-08-15T03:44:38 1983-02-16T19:54:45

NAMING_CONVENTION: IDM files are named according to the U.T. starting date and time of the data in the file. Example: IDM821141206.DAT indicates that this is an IDM file for the year (19)82, day 114, hour 12, minute 06.

PREV_LOG_VOL_TIME_COVERAGE: NONE

CCSDXKNM0002EMARK005CCSDXRNM0003SMARK006

NESTING=L

REF=IDMFORMAT.SFD

CCSDXRNM0003EMARK006CCSDXRLM0003SMARK007

ADI=NSSD0055

CLASS=I

NESTING=N

SCOPE=EACH

REF=[IDM] IDM*.dat;*

CCSDXRLM0003EMARK007CCSDXZLM0001EMARK001

TYPE OF FILE NAME: ~~IDM~~ FILES
RECORD_TYPE_NAMES: IDM_1
RECORD_TYPES:

RECORD_TYPE_NAME: IDM_1
MAXIMUM_RECORD_TYPE_LENGTH: 4100 BYTES

FIELD_NAME: DATE
FIELD_MNEMONIC: DATE
FIELD_DESCRIPTION: Year and day number of the year of the record in the
form YYDDD. (e.g. 81264 is day 264 of year 1981.)
FIELD_RESOLUTION: 1 day
FIELD_RANGE:
MINIMUM_VALUE: 81215
MAXIMUM_VALUE: 83049
FIELD_IDIOSYNCRACIES: None
FIELD_SYNTAX: VI4

FIELD_NAME: TIME
FIELD_MNEMONIC: TIME
FIELD_DESCRIPTION: The universal time (UT) time of the day in milliseconds (ms)
of the start of the 8 second block of data contained in the record. All the
fields describing satellite location are calculated for this time.
FIELD_RESOLUTION: 1 ms
FIELD_RANGE:
MINIMUM_VALUE: 0
MAXIMUM_VALUE: 86399999
FIELD_IDIOSYNCRACIES: None
FIELD_SYNTAX: VI4

FIELD_NAME: Geographic latitude
FIELD_MNEMONIC: Glat
FIELD_DESCRIPTION: The geographic latitude of the spacecraft in degrees.
FIELD_RESOLUTION: 0.0001 degrees
FIELD_RANGE:
MINIMUM_VALUE: -90.0 degrees
MAXIMUM_VALUE: 90.0 degrees
FIELD_IDIOSYNCRACIES: See RECORD_TYPE_ALGORITHMS
FIELD_SYNTAX: VR4

FIELD_NAME: Geographic longitude
FIELD_MNEMONIC: Glon
FIELD_DESCRIPTION: The geographic longitude of the spacecraft in degrees.
FIELD_RESOLUTION: 0.001 degrees
FIELD_RANGE:
MINIMUM_VALUE: -180.0 degrees
MAXIMUM_VALUE: 180.0 degrees
FIELD_IDIOSYNCRACIES: See RECORD_TYPE_ALGORITHMS
FIELD_SYNTAX: VR4

FIELD_NAME: Invariant latitude
FIELD_MNEMONIC: Ilat
FIELD_DESCRIPTION: The invariant latitude of the spacecraft in degrees.
FIELD_RESOLUTION: 0.0001 degrees
FIELD_RANGE:
MINIMUM_VALUE: 0.0 degrees
MAXIMUM_VALUE: 90.0 degrees
FIELD_IDIOSYNCRACIES: See RECORD_TYPE_ALGORITHMS
FIELD_SYNTAX: VR4

FIELD_NAME: Magnetic local time
FIELD_MNEMONIC: Mlt
FIELD_DESCRIPTION: The magnetic local time of the spacecraft in hours.
FIELD_RESOLUTION: 0.0001 hours
FIELD_RANGE:
MINIMUM_VALUE: 0.0 hours

MAXIMUM_VALUE: 24.0 hours
FIELD_IDIOSYNCRACIES: See RECORD_TYPE_ALGORITHMS
FIELD_SYNTAX: VR4

FIELD_NAME: Altitude
FIELD_MNEMONIC: Alt
FIELD_DESCRIPTION: The altitude of the spacecraft in km.
FIELD_RESOLUTION: 0.01 km
FIELD_RANGE:
MINIMUM_VALUE: 200. km
MAXIMUM_VALUE: 1012. km
FIELD_IDIOSYNCRACIES: See RECORD_TYPE_ALGORITHMS
FIELD_SYNTAX: VR4

FIELD_NAME: Spacecraft Velocity
FIELD_MNEMONIC: Scvel
FIELD_DESCRIPTION: The geocentric velocity of the spacecraft in m/s
FIELD_RESOLUTION: 1.0 m/s
FIELD_RANGE:
MINIMUM_VALUE: 7000. m/s
MAXIMUM_VALUE: 8000. m/s
FIELD_IDIOSYNCRACIES: See RECORD_TYPE_ALGORITHMS
FIELD_SYNTAX: VR4

FIELD_NAME: Number of TIME-VELOCITY pairs in IDM_1 record
FIELD_MNEMONIC: Nrec
FIELD_DESCRIPTION: This is an integer giving the number times the Vtime and Vion fields will be repeated in the record.
FIELD_RESOLUTION: 1
FIELD_RANGE:
MINIMUM_VALUE: 4
MAXIMUM_VALUE: 508
FIELD_IDIOSYNCRACIES: None
FIELD_SYNTAX: VI4

FIELD_NAME: Time of ion velocity measurement
FIELD_MNEMONIC: Vtime
FIELD_DESCRIPTION: The universal time (UT) time of the day in milliseconds (ms).
of the following ion velocity measurement (Vion).
FIELD_RESOLUTION: 1 ms
FIELD_RANGE:
MINIMUM_VALUE: 0
MAXIMUM_VALUE: 86399999
FIELD_IDIOSYNCRACIES: None
FIELD_SYNTAX: VI4

FIELD_NAME: Ion velocity measurement
FIELD_MNEMONIC: Vion
FIELD_DESCRIPTION: The component of the ion velocity parallel to the y-axis (approximately vertical, a positive value indicates an upward velocity) or the z-axis (approximately horizontal) of the spacecraft rounded to the nearest 1 meter/second. The first two digits to the right of the decimal point are not data values, but indicators of data quality and the mode of operation of the IDM.

In the most common mode of operation, two velocity measurements are made along one axis during a minor telemetry frame (1/4 second). Normally, only the first of these is included in these files. This means that the data points for each axis will be equally spaced in time. If the first point is determined to be bad (fill or "flyer") then the second point will be used. If the first digit after the decimal point is even then the first data point in the minor frame has been used. If odd, the second. In addition, velocity measurements taken during times of low ion density (Ni) are not as reliable. The first digit after the decimal indicates this as follows:

- 0 or 1 ; $N_i > 2.0E4$, velocity measurements are good.
- 2 or 3 ; $2.0E4 > N_i > 7.0E3$, averaging several data points is recommended
- 4 or 5 ; $N_i < 7.0E3$, data are unreliable.

The second digit after the data point indicates the axis of the measurement. If the second digit after the decimal point is

even, then the associated velocity measurement is along the horizontal (z) axis. If odd, the measurement is of the vertical (y-axis) velocity.

Some modes of operation of the IDM may result in unequal time spacing of the data points or sections of data where only one axis is sampled. Use of the time tags and the axis flag is therefore always recommended.

Caution should be exercised when using the data near the beginning or the end of a file. There are often periods of several (up to 10) 8-second blocks where the satellite instrumentation and/or telemetry is in the process of being turned on or off. As a result any large value (>4000 m/s) for the ion velocity measurements at such times is probably incorrect.

FIELD_RESOLUTION: 1 m/s

FIELD_RANGE:

MINIMUM_VALUE: -5000. m/s

MAXIMUM_VALUE: 5000. m/s

FIELD_IDIOSYNCRACIES: See RECORD_TYPE_ALGORITHMS

FIELD_SYNTAX: VR4

RECORD_TYPE_FIELD_RELATIONSHIPS: The order of the fields in an IDM_1 record is as follows: DATE, TIME, Glat, Glon, Ilat, Mlt, Alt, Nrec, 1st Vtime, 1st Vion, 2nd Vtime, 2nd Vion,, Nrec-th Vtime, Nrec-th Vion. Each record nominally contains 8 seconds of data.

RECORD_TYPE_ALGORITHMS: The real fields of an IDM_1 record are initialized with a fill value of 9999999.0 and subsequently the geophysical values are inserted. Thus if there is no data available for a given parameter that particular field will contain the fill data value.

MISCELLANEOUS_TYPE_OF_FILE_ATTRIBUTES: IDM files are sequential with a single type of variable length record (IDM_1).

CCSDYDNM000200NSSD0055EMARK001

Video 8

REC. MODE ☐ LP (4hrs) ☐ SP (2hrs)
☐ PCM ON ☐ MULTI ☐ STEREO ☐ BILINGUAL

8

Save Set Name: DEB7_0002A.BCK

Written with VAX BACKUP utility
 Blocksize = 32768

This volume contains the complete
 DE-2 Ion Chromatogram data set

8

Save Set Name: DEB7_0002A.BCK
 Written with VAX BACKUP utility
 Blocksize = 32768

This volume contains the DE-2
 Ion Chromatogram data
 bits 6000-8562

8

Video 8

REC. MODE ☐ LP (4hrs) ☐ SP (2hrs)
☐ PCM ON ☐ MULTI ☐ STEREO ☐ BILINGUAL

8

Save Set Name: DEB7_0003A.BCK
 Written with VAX BACKUP utility
 Blocksize = 32768

This volume contains the complete
 DE-2 Ion Chromatogram data set

Save Set Name: DEB7_0003A.BCK
 Written with VAX BACKUP utility
 Blocksize = 32768

This volume contains the DE-2
 Ion and PVT meter data for
 bits 6000-8562

Dear Mr. [unclear]

Dear [unclear] Here is finally [unclear]
 Let me know when you get
 it and if it looks ok.
 Thank you

Robert Colby

VAX/VMS Backup format 4.5 Gig

HS-8/112

DE-2 RPA NSSDC Files
Created at Univ. Texas at Dallas
W. Robin Coley 6/12/95

maxell

TAPE LABEL: DE2RPA
Save Set: DE2RPA.BCK

To: Dieter Bilitza

D108237

81-070B-06A-07A
DE2RPA.BCK

INDH

08/13/81 - 02/14/83

BYTES
81227

RECORD 2 46 BYTES

RECORD 180 46 BYTES

(0	03000000	E3001343	403933C3	50833343	11C6B340	7868A444	F03DF446	06A90100	00002ZA3
(40)	E3008041	EC51							

HEX DUMP OF RPA812181706.DAT
Restored from D-107810

RECORD 1 86 BYTES

(0)	0300423D	0100BB45	AC03ECFF	FFFF8A45	00000944	289C46C4	99994C46	00E01948	0074FAC0	365EDC47
(40)	00002D47	00D0184C	7F96184C	7F96184C	7F960042	00004041	0000C0C2	BA0D4CC3	7C82E442	AB995942
(80)	C4136745	4704								

RECORD 2 86 BYTES

(0)	0300423D	0100FB64	AC03ECFF	FFFF7345	00805643	A0703EC4	99996646	00F00C48	00A0DDC0	F2D2D747
(40)	005C0347	00C8184C	7F96184C	7F96184C	7F96A041	00004041	0000C9C2	EB654CC3	7CA4E342	B3245942
(80)	471D6745	C475								

RECORD 147 86 BYTES

(0)	0300423D	01005813	B703CAFF	FFFF95C5	0060A442	40E1FFC3	32330B46	0000F747	00BA5340	3433D747
(40)	009C184C	7F968046	0080184C	7F96184C	7F960000	00004041	00006442	1D4A58C3	3C500743	0E525B42
(80)	D3DA7B45	44CF								

RPA
D-107810
08/04/81 - 02/01/82